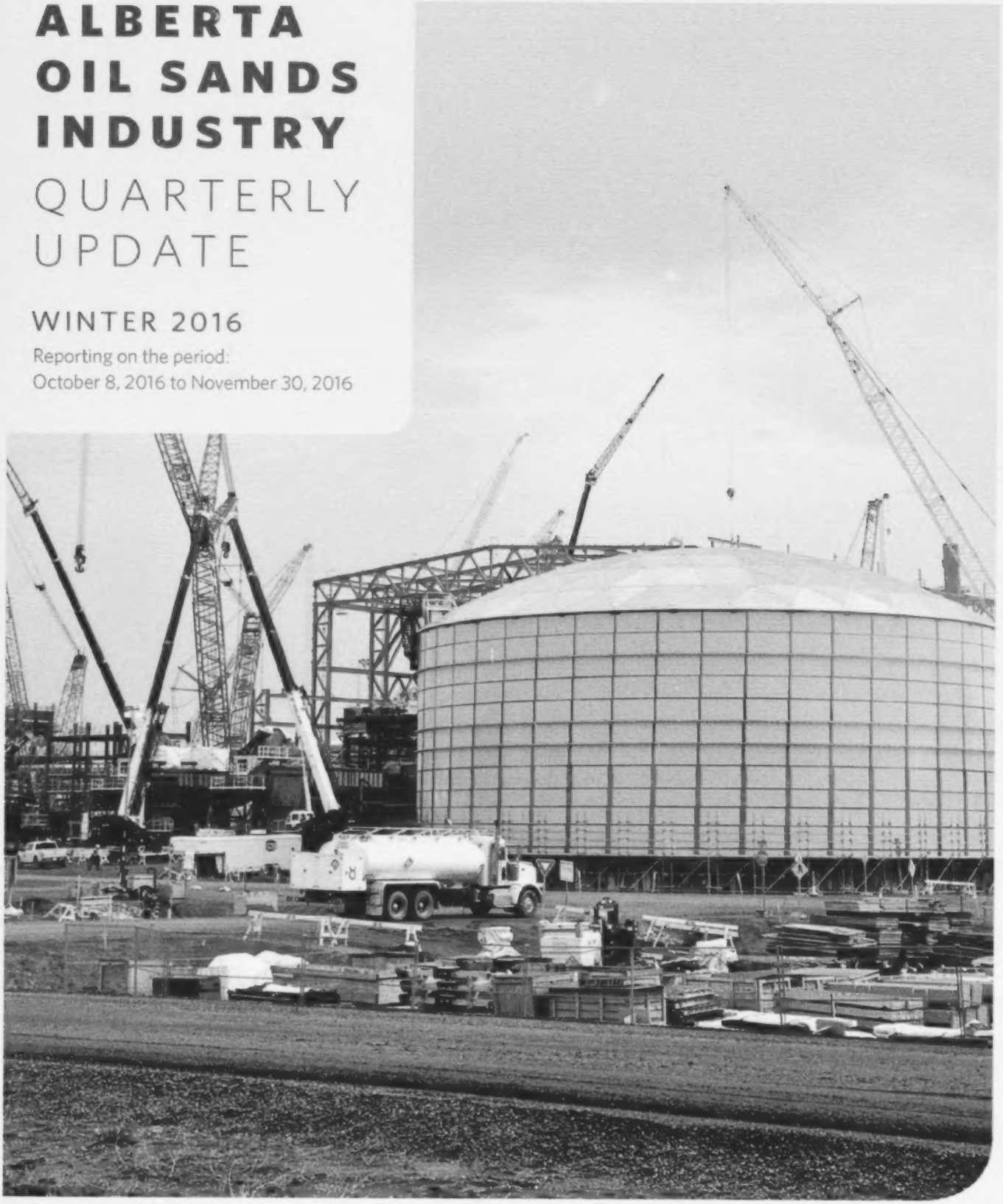
ALBERTA OIL SANDS INDUSTRY QUARTERLY UPDATE

WINTER 2016

Reporting on the period:
October 8, 2016 to November 30, 2016



All about the oil sands

Background of an important global resource

Canada has the third-largest oil reserves in the world, after Saudi Arabia and Venezuela. Of Canada's 173 billion barrels of oil reserves, 170 billion barrels are located in Alberta, and about 168 billion barrels are recoverable from bitumen. This is a resource that has been developed for decades but is now gaining increased global attention as conventional supplies—so-called "easy" oil—continue to be depleted. The figure of 168 billion barrels of bitumen represents what is considered economically recoverable with today's technology, but with new technologies, this reserve estimate could be significantly increased. In fact, total oil sands reserves in place are estimated at 1.8 trillion barrels.

There are three major bitumen (or oil sands) deposits in Alberta. The largest is the Athabasca deposit, which is located in the province's northeast in the Regional Municipality of Wood Buffalo. The main population centre of the Athabasca deposit is Fort McMurray. The second-largest oil sands deposit is referred to as Cold Lake, just south of Athabasca, with the main population centre the City of Cold Lake. The smallest oil sands deposit is known as Peace River, which is located in northwest-central Alberta. A fourth deposit called Wabasca links to the Athabasca and is generally lumped in with that area.

The existence of bitumen in Alberta has been known for a long time. The first mention of it in Canadian history was in 1719, when a Cree named Wapasu brought a sample of the "gum" to a Hudson's Bay trading post. First Nations in what is now the Wood Buffalo area had traditionally used the bitumen, which seeps from outcrops along the Athabasca River, to waterproof their canoes.

For the first time in 2012, in situ oil sands production exceeded mined oil sands production in Alberta. In 2015, 54 per cent of the province's oil sands volumes were produced using in situ methods. Alberta will continue to rely to a greater extent on in situ production in the future, as 80 per cent of the province's proven bitumen reserves are too deep under-ground to recover using mining methods.

There are essentially two commercial methods of in situ (Latin for "in place," essentially meaning wells are used rather than trucks and shovels). In cyclic steam stimulation (CSS), high-pressure steam is injected into directional wells drilled from pads for a period of time, then the steam is left to soak in the reservoir for a period, melting the bitumen, and then the same wells are switched into production mode, bringing the bitumen to the surface.

In steam assisted gravity drainage (SAGD), parallel horizontal well pairs are drilled from well pads at the surface. One is drilled near the top of the target reservoir, while the other is drilled near its bottom. Steam is injected into the top well, a steam chamber forms, and the melted bitumen flows into the lower well via gravity and is pumped to the surface using artificial lift.

Both SAGD and CSS are used in the Cold Lake and Peace River deposits, while SAGD is the in situ technology of choice in the Athabasca deposit. The selection is based on a number of factors, including geology. The technologies combined currently produce just over one million barrels per day.

Research is underway on a number of other production technologies designed to optimize production, including variations on solvent-assisted SAGD and CSS, recovery using electricity and in situ combustion.

Bitumen that has not been processed, or "upgraded," can be used directly as asphalt. It must be diluted to travel by pipeline. Adding value, some producers upgrade their product into synthetic crude oil, which is a refinery feedstock. That can be transformed into transportation fuels and other products. ■

TABLE OF CONTENTS

3 Mapping the oil sands

4 Government update

6 Labour market update

7 What's new in the oil sands: Business

8 What's new in the oil sands: Technology

9 Oil sands production data
Production by extraction method, aggregate synthetic crude oil and bitumen production

Oil sands technology legend

10 Project listings

16 Glossary

18 Oil sands contacts

On the Cover: Construction underway at the Sturgeon Refinery in fall 2015. This facility is the first new refinery to be built in Canada in 30 years, and will run fully on bitumen feedstock.

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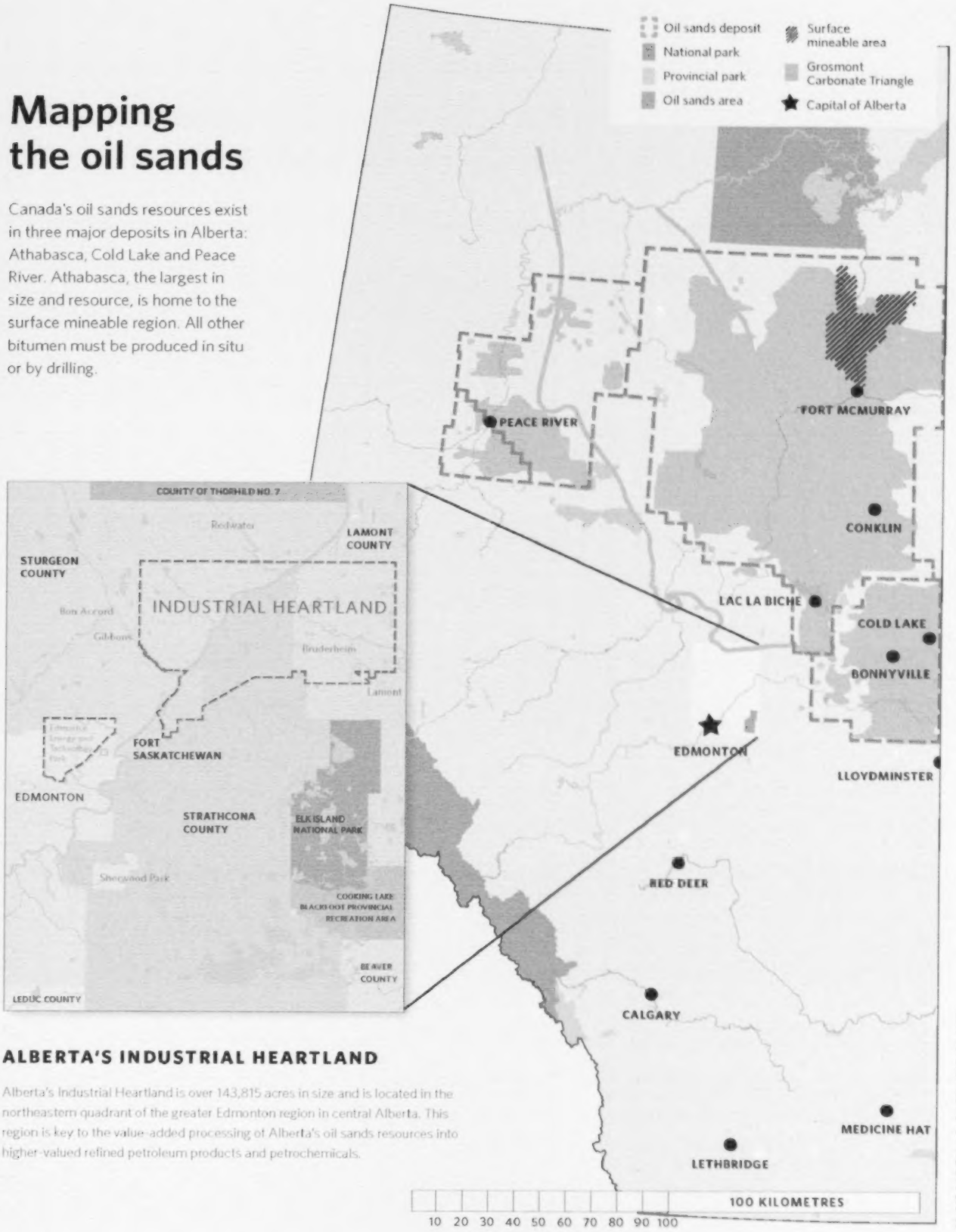
Mapping the oil sands

Canada's oil sands resources exist in three major deposits in Alberta: Athabasca, Cold Lake and Peace River. Athabasca, the largest in size and resource, is home to the surface mineable region. All other bitumen must be produced in situ or by drilling.



ALBERTA'S INDUSTRIAL HEARTLAND

Alberta's Industrial Heartland is over 143,815 acres in size and is located in the northeastern quadrant of the greater Edmonton region in central Alberta. This region is key to the value-added processing of Alberta's oil sands resources into higher-valued refined petroleum products and petrochemicals.

GOVERNMENT UPDATE

Alberta Government

ALBERTA WELCOMES FEDERAL APPROVAL OF TRANS MOUNTAIN AND LINE 3 PIPELINES

Alberta Premier Rachel Notley issued a statement following Prime Minister Justin Trudeau's approval of two major energy infrastructure projects on November 29, 2016.

The federal government has approved Kinder Morgan's proposed Trans Mountain Expansion project from Strathcona County, Alta., to Burnaby, B.C., as well as Enbridge's Line 3 Replacement Project, which connects Alberta to Wisconsin through Manitoba.

The two projects will increase Alberta's crude oil export capacity by about one million barrels per day.

Trudeau cited Alberta's Climate Leadership Plan as a key policy piece supporting the project approvals.

"We are getting a chance to break our land lock," Notley said. "We're getting a chance to sell to China and other new markets at better prices. We're getting a chance to reduce our dependence on one market, and therefore to be more economically independent. And we're getting a chance to pick ourselves up and move forward again."

Notley said that of equal importance, Canada is building the economy within a strong new national environmental policy. "We are getting out of coal by 2030. We are implementing an emissions cap in the oil sands. And we will all be phasing in a $50 carbon levy to help reduce emissions and to help finance a transition to a lower-carbon economy," she said. "We don't have to choose between the environment and building the economy. Canada is going to be a global leader on climate change. And our country will still create jobs and greater economic equality."

Both projects have been approved subject to binding conditions (157 for Trans Mountain and 37 for Line 3) that will address potential Indigenous, socio-economic and environmental impacts.

The Government of Canada says the $6.8-billion Trans Mountain Expansion will create 15,000 new jobs during construction by twinning the existing system. It will also provide access to global markets and generate significant direct economic benefits, including $4.5 billion in federal and provincial government revenues.

The $4.8-billion Line 3 Replacement Project will replace 1,067 kilometres of existing pipeline from Hardisty, Alberta, to Gretna, Manitoba, to enhance its safety and integrity. The project will generate significant economic benefits, including $514.7 million in federal and provincial government revenues and 7,000 new jobs during construction. It also provides a vital link to the North American refinery market for Canadian oil.

The federal government has also directed the National Energy Board to dismiss Enbridge's Northern Gateway Pipelines Project application. The project would have run from Alberta to Kitimat, B.C. Ottawa says it has determined that the project is not in the public interest, given that it would result in crude oil tankers transiting through the sensitive ecosystem of the Douglas Channel, which is part of the Great Bear Rainforest.

ALBERTA REDUCES DEFICIT FORECAST, ADDS 25,000 MORE JOBS IN 2016-17 FISCAL UPDATE

Alberta's economic situation has improved slightly, according to the province's 2016-17 second quarter fiscal update, but the government will finish the fiscal year with a deficit as ongoing low oil pricing continues.

According to the fiscal update released on November 28, Alberta now projects a 2016-17 deficit of $10.8 billion, which is $449 million higher than

forecast at budget, largely due to the $520-million fiscal impact of the Wood Buffalo wildfire.

The West Texas Intermediate (WTI) oil price is forecast at US$45 per barrel, which is slightly higher than the WTI price of $42 per barrel previously forecasted in the budget.

While the province expects real gross domestic product (GDP) to decline by 2.8 per cent in 2016, due partially to the impacts of Wood Buffalo wildfires earlier this year, indications such as drilling activity and oil production suggest stabilizing business activity. In addition to this, after three consecutive months of gains totaling 25,000 jobs, there was a pull-back of 12,800 jobs in November. Employment still remains up by about 12,000 from the low in July.

The government anticipates real GDP will recover modestly in 2017, growing by 2.3 per cent thanks largely to rebounding oil prices and production, public infrastructure investment, as well as Fort McMurray reconstruction.

"We are sticking with our plan, which is to bring down the deficit over time, to invest in capital infrastructure, to help Albertans out through this downturn, and to work to make sure we are diversifying the economy," said President of Treasury Board and Finance Minister Joe Ceci.

Minister Ceci also emphasized that while the government is taking the "right approach" and positive pipeline announcements will positively impact the economy, uncertainty makes prudence a necessity, which is why the risk adjustment will not change. "I am positive around all of that, but the risk adjustment stays in the budget with regard to the $700 million as a result of OPEC or volatility in the oil price, international price."

OIL SANDS EMISSIONS CAP DRIVES INNOVATION

In November 2016, Shannon Phillips, Alberta's Minister responsible for the Climate Change Office , introduced the Oil Sands Emissions Limit Act. If passed, the act will cap oil sands greenhouse gas (GHG) emissions to 100 megatonnes per year.

The GHG cap, which was originally announced with the support of several industry and environmental leaders in November 2015, will not obligate oil sands producers until a regulatory system is designed and implemented, the government says.

"Our support for the oil sands emissions limit and climate policy leadership reflects the ongoing collective support for responsible development of

the oil sands," read a statement from the Industry Caucus of the Oil Sands Advisory Group: Canadian Natural Resources, Cenovus, ConocoPhillips Canada, MEG Energy, Shell Canada, Statoil Canada and Suncor. "We believe that by investing in technology and innovation, we can produce oil from the oil sands on a globally carbon competitive basis. The Alberta Climate Leadership Plan emissions limit acts as an incentive to continually improve our performance in a carbon-constrained world. We look forward to providing advice on the effective implementation of the emissions limit."

The cap is a cornerstone of Alberta's Climate Leadership Plan, allowing the oil sands industry to grow sustainably, while repairing the province's reputation. Limits on oil sands emissions will provide an incentive for companies to invest in greenhouse gas reduction as well as innovative technologies that will pave the way for Alberta's energy industry to lead in a low-carbon future.

Alberta's climate plan and the oil sands emissions cap have been lauded by U.S. President Barack Obama.

Minister Phillips promoted the plan at the United Nations climate conference in Marrakech, Morocco, in November 2016. This plan will enhance Alberta's reputation for developing pragmatic solutions to climate change.

The legislation will provide certainty for investors, drive innovation among producers to create new solutions for energy extraction and help protect jobs and create new ones while tackling emissions and protecting the health of future generations. ■

LABOUR MARKET UPDATE

OPPORTUNITIES EXIST FOR THE "GOLDMIND" OF UNEMPLOYED OIL AND GAS PROFESSIONALS IN CALGARY

If the baby boomers retire from the energy sector at historical rates, the resulting job openings could potentially provide more employment prospects over the next few years than those from increased industry activity, unemployed oil and gas professionals heard at a December session.

"There will be opportunity as a result of the retirement factor, and in fact those jobs may exceed the number of jobs that may be available as a result of industry activity," said Carol Howes, vice-president of communications and PetroLMI, a division of Enform.

The event was organized by the GoldMind Project, in collaboration with Calgary Economic Development and professional firm Higher Landing.

The project is aimed at mobilizing Calgary's vast reserve of underutilized professional talent.

"It would be fair to surmise from all the research we are working on, and have been working on over the last couple of years, that there is a structural change in the industry," she said. "We probably are not going back to 2014, but there will be opportunities."

For example, PetroLMI research suggests that while the construction portion of many major oilsands projects is ending, jobs will shift more towards operations, maintenance and ongoing production.

"Some jobs will continue to reduce over the next few years as these construction jobs come to an end, but on the other side there is job growth. It is promising," Howes said.

LABOUR FORECAST HELPS ALBERTANS GET "FUTURE READY"

The province's Occupational Demand and Supply Outlook, 2015-2025, helps employers, students, workers and post-secondary institutions plan for labour-market needs.

Released in November, the latest outlook forecasts that 401,000 jobs will be created by 2025, while 352,000 workers will join the labour force by then. Even with the economic challenges caused by the drop in the global price of oil, Alberta's long-term labour demand is expected to outgrow supply by 49,000 workers over the next 10 years.

"In these challenging economic times, the Alberta government is committed to providing up-to-date labour-market information to help Albertans plan for new career opportunities. The Demand and Supply Outlook is an important tool to help businesses and workers prepare for future labour market needs," said Christina Gray, Minister of Labour.

"Good-quality labour-market information is important in our work with students as we help them make career choices and target their job search. Sifting through the constant flow of labour-market information can be a challenge, but having comprehensive information from a credible source is extremely valuable," said Joan Schiebelbein, director, University of Alberta Career Centre.

Examples of occupations which could have labour shortages by 2025:

- Managers in construction and transportation (shortage of 1,386 workers);
- Computer and information systems professionals (shortage of 1,426 workers);
- Nurse supervisors and registered nurses (shortage of 5,434 workers);
- Medical technologists and technicians (shortage of 2,322 workers); and
- Sales and service supervisors (shortage of 1,145 workers).

Alberta leads Canada in providing high-quality data and labour-market information to help employers, students, workers, post-secondary institutions and industry associations begin working to meet the province's needs in high-demand occupations.

The outlook forecasts labour-market shortages or surpluses for more than 250 occupations over the next decade.

The forecast helps inform the Government of Alberta's "Future Ready" effort to co-ordinate education and training from kindergarten to work so all Albertans have the knowledge and skills they need to succeed in a changing economy. ■

WHAT'S NEW IN THE OIL SANDS

BUSINESS

Devon Energy has completed the sale of its 50 per cent ownership interest in the Access Pipeline to Wolf Midstream, a portfolio company of Canada Pension Plan Investment Board, for $1.4 billion.

Devon owns the pipeline in partnership with MEG Energy, which is also looking to sell its interest in the system. Access connects Devon's Jackfish and MEG's Christina Lake SAGD projects with the Edmonton region transportation hub.

Suncor Energy has green-lighted work using Wood Group's standard well pad design at the company's Firebag SAGD oil sands facility under a recently signed three-year agreement between the two companies.

It is estimated that over the life of a SAGD project, two-thirds of all capital spending is on well pads and gathering line infrastructure.

The standard well pad design is expected to save Suncor 50 per cent of its well pad facilities costs compared to its existing well pad design, dropping Suncor's costs to $2 million per well pair from a range of $4 million–$9 million per well pair.

Suncor and Mikisew Cree First Nation (MCFN) have signed a participation agreement for the purchase by MCFN of a 14.7 per cent interest in Suncor's East Tank Farm Development. The East Tank Farm will support the Fort Hills mining project currently under construction.

Under the terms of the agreement, MCFN will pay 14.7 per cent of the actual capital cost of the East Tank Farm Development once the assets become operational, which is currently anticipated to be in the second quarter of 2017. MCFN's share of the actual capital cost of the East Tank Farm Development is currently anticipated to be approximately $147 million, which will be payable to Suncor upon closing.

The latest phase of Canadian Natural Resources's Horizon project, Phase 2B, has started up and is expected to reach full production by November.

That will take capacity at the mining and upgrading project to around 182,000 bbls/d, up from 137,000 bbls/d currently.

North American Energy Partners says that in October it was awarded a multi-year contract with an unnamed "major oil sands operator" to support mining and SAGD operations through 2020. The agreement is for reclamation, overburden removal, mine support services and civil construction activities.

North American says it had previously performed mine support and construction services for this oil sands operator under a five-year master services agreement that covered one base oil sands mining operation.

The new agreement extends to the company's SAGD operations, as well as a "second oil sands mining operation being constructed [estimated late 2017 production]," North American says.

This description makes it quite likely that the company was awarded the agreement by Suncor Energy, which not only has both mining and SAGD operations, but is currently building the Fort Hills project, with first oil expected in late 2017.

The final push on construction of the Japan Canada Oil Sands (JACOS) Hangingstone SAGD expansion will be delayed from 2016 into mid-2017.

The capital cost for the 20,000-bbl/d project—shared with 25 per cent partner Nexen—will also increase from $1.25 billion to $1.5 billion.

JACOS says it reviewed the project schedule and costs as construction of the central processing facility (CPF) reaches the final stage. The project was 96 per cent complete as of September 2016.

The company says the CPF has been delayed in engineering, module fabrication and field construction. Work was also delayed for approximately one month due to the wildfire in Wood Buffalo this spring.

Meanwhile, the Hangingstone SAGD pilot, which started operating in 1999, remains suspended until market conditions improve, JACOS says.

Canadian Natural Resources says it will restart work on the 40,000-bbl/d Kirby North SAGD project, an expansion to its 40,000-bbl/d Kirby South facility that started operating in late 2013. Engineering and procurement commencing will commence in 2017, with a focus on finding opportunities to continue to reduce construction costs to completion, Canadian Natural says. Kirby North will be targeted to deliver first steam-in in 2019 with first oil targeted in 2020. ■

WHAT'S NEW IN THE OIL SANDS

TECHNOLOGY

■ The new Sturgeon Refinery near Edmonton has selected GE Water & Process Technologies' ultrafiltration and membrane bioreactor technology to treat and recycle process water.

The system is designed to reduce the use of fresh water at the 50,000-bbl/d plant, which is scheduled for start-up in late 2017.

Process water from the refinery will be treated and recycled multiple times, GE says.

"Surface water runoff from the facility will be contained in the retention ponds and used for process purposes to reduce the water withdrawal from the North Saskatchewan River," the company said in a statement.

"Chemistry and on-site technical support from Water & Process Technologies will not only ensure that the facilities' water balance targets are met, but also will maintain the reliability of its various assets by protecting them from deposition and corrosion."

■ A Cenovus Energy led initiative is improving the ability of oil sands operators to restore disturbed land year-round using amphibious machinery.

Results of a test conducted in 2015 showed that the techniques used in the winter with conventional equipment can be done in non-frozen conditions using amphibious equipment.

These tests, which included collaboration with ConocoPhillips, Devon and Nexen through Canada's Oil Sands Innovation Alliance, could lead to quicker, lower-cost year round habitat restoration—with the exception of restricted activity periods to accommodate certain bird species.

Cenovus expects to deploy amphibious equipment over a wider landscape in late summer and fall of 2017 primarily to benefit woodland caribou.

■ The extra capital cost of installing flow control devices (FCDs) in wells at the new Surmont 2 SAGD project is paying off to the point that ConocoPhillips is deploying the technology beyond its original plans.

About 30 per cent of the well pairs at Surmont 2 were originally equipped with FCDs when the 118,000-bbl/d SAGD expansion was commissioned in mid-2015.

Since achieving first oil last September, ConocoPhillips says the devices have achieved impressive results—doubling cumulative oil production from the equipped well pairs.

The FCDs have been so effective that the company says it is retrofitting them into wells that were originally drilled without them.

ConocoPhillips is also testing non-condensable gas (NCG) co-injection at Surmont 2, which is expected to reduce both steam oil ratios and greenhouse gas emissions intensity by up to 20 per cent.

An NCG co-injection pilot is planned to start at Surmont 2 before the end of the year, with results anticipated in 2017.

■ Foresight Cleantech Accelerator Centre, Canada's Oil Sands Innovation Alliance (COSIA) and Alberta Innovates have launched an ARCTIC Challenge for hot water production technologies. The challenge aims to reduce greenhouse gas emissions and increase energy efficiency by identifying alternative methods for generating hot water for mining and extraction processes in the oil sands.

The Mining Hot Water Production Challenge is the first ARCTIC Challenge to be sponsored by the federal and Alberta governments, in partnership with COSIA. It represents the collective ambition of Canadian government and industry to work together on solutions that drive low-carbon, sustainable growth and reduce environmental impacts, the partners say.

■ Acceleware has filed a new patent application that it says will improve the economics of and speed time to oil production for its proposed radio frequency XL heating technology. Similar to the principle of a microwave oven, the technology uses radio waves instead of steam to heat bitumen in situ.

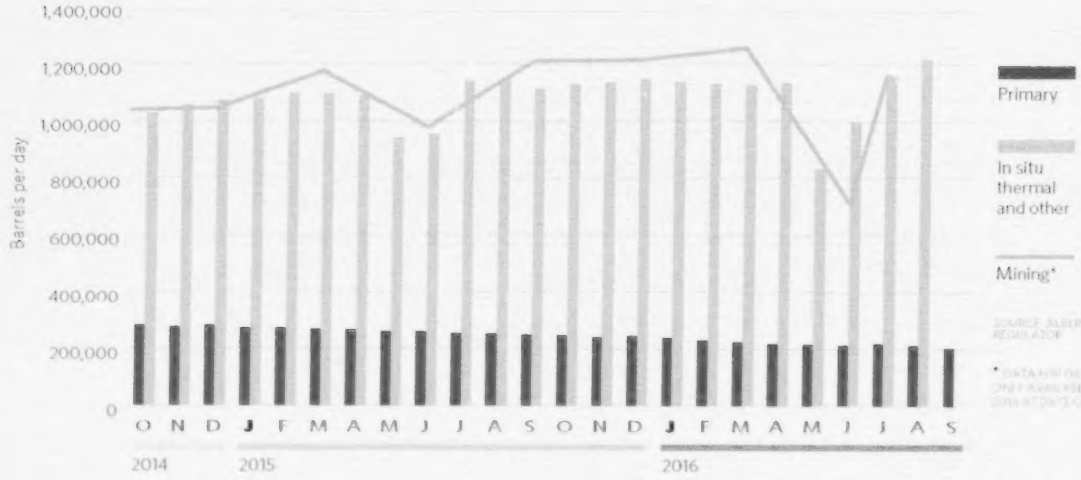
The company, which is working with GE to advance the technology, says the process has the potential to save billions of dollars in oil sands production costs while significantly reducing greenhouse gas emissions and water use in typically energy intensive oil sands production.

■ Kal Tire's Mining Tire Group and the University of British Columbia have formed a research partnership that will allow the two organizations to collaborate in developing technology and innovative solutions for the mining tire industry. Projects may include everything from robotics and metallurgical design to environmentally responsible ways to use recycled tire crumb. ■

IMAGE: SUNCOR ENERGY

OIL SANDS PRODUCTION DATA

Alberta oil sands production by extraction method



SOURCE: ALBERTA ENERGY REGULATOR

* DATA FOR OIL SANDS MINING ONLY AVAILABLE TO AUGUST 2016 AT DATE OF PUBLICATION

Alberta crude bitumen and synthetic crude production

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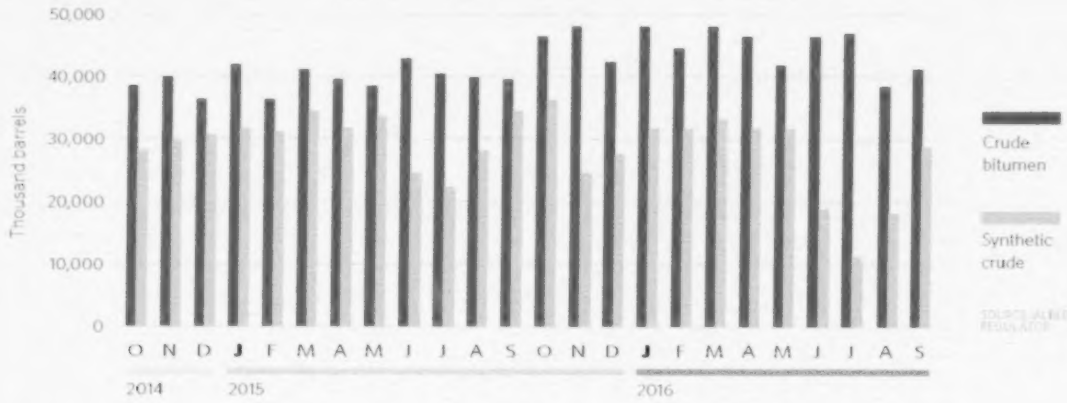


SOURCE: ALBERTA ENERGY REGULATOR

OIL SANDS TECHNOLOGY LEGEND

See oil sands project status listing on page 10

ADC (Upgrading) Accelerated decontamination

AIRINJ Air injection

C & SC Cyclic and solvent cyclic

CCC (Upgrading) Cold catalytic cracking

C-SAGD Cyclic steam assisted gravity drainage

CSS Cyclic steam stimulation

ESEIEH Enhanced solvent extraction incorporating electromagnetic heating

ET-DSP Electro-thermal dynamic stripping

HCSS Horizontal cyclic steam stimulation

HTL Heavy-to-light upgrading process

In situ Production technology undisclosed; will use drilling and enhanced recovery

LP-SAGD Low-pressure steam assisted gravity drainage

Mining Truck and shovel mining

Nsolv purified condensing solvent extraction technology

Steam & CO_2 Steam & CO_2 Co-gen Co-injection

Orcrude Primary upgrading process

SAGD Steam assisted gravity drainage

SAP Solvent aided process

SC-SAGD Solvent cyclic steam assisted gravity drainage

TAGD Thermal assisted gravity drainage

THAI Toe to heel air injection

UPG Bitumen upgrading

USP (Upgrading) Ultra-selective pyrolysis

VSD Vertical steam drive

PROJECT LISTINGS See oil sands project technology legend on page 9.

Updated status of oil sands projects in Alberta | As of December 2016

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
NORTH ATHABASCA REGION — MINING				
Canadian Natural Resources Limited				
Horizon				Updated: Nov 2016
Canadian Natural Resources executed a major planned turnaround in July to tie-in Phase 2B. Current production volumes at Horizon are 175,00 bbls/d since start-up of Phase 2B. Horizon Phase 3 reached 87% physically complete in Q3; Phase 3 remains on track for targeted start up in Q4 2017.				
Phase 1	135,000	2008	Operating	**Mining**
Reliability - Tranche 2	5,000	2014	Operating	**Mining**
Phase 2A	12,000	2014	Operating	**Mining**
Phase 2B	45,000	2016	Operating	**Mining**
Phase 3	80,000	2017	Construction	**Mining**
Imperial Oil Limited				
Kearl				Updated: May 2016
Imperial says that Kearl bitumen production averaged 165,000 bbls/d in Q1. The increase was largely due to continued strong performance from the expansion project and optimization efforts at the combined Kearl operation.				
Phase 1	110,000	2013	Operating	**Mining**
Phase 2	110,000	2015	Operating	**Mining**
Phase 3	80,000	TBD	On Hold	**Mining**
Phase 4 Debottleneck	45,000	TBD	On Hold	**Mining**
Shell Albian Sands				
Jackpine				Updated: Nov 2016
Marathon reported that production will be lower in Q4 due to planned maintenance.				
Phase 1A	100,000	2010	Operating	**Mining**
Phase 1B	100,000	TBD	Approved	**Mining**
Expansion	100,000	TBD	Approved	**Mining**
Muskeg River				Updated: Nov 2016
Marathon reported that production will be lower in Q4 due to planned maintenance.				
Commercial	155,000	2002	Operating	**Mining**
Expansion & Debottlenecking	115,000	TBD	Approved	**Mining**
Pierre River				Updated: Mar 2015
Shell has withdrawn its application for the Pierre River project, saying it wants to focus on its existing oil sands operations. The company says it will continue to hold the Pierre River leases and may reapply in the future.				
Phase 1	100,000	TBD	Cancelled	**Mining**
Phase 2	100,000	TBD	Cancelled	**Mining**
Suncor Energy Inc.				
Base Operations				Updated: Nov 2016
Suncor completed major planned maintenance on its U2 upgrader in 2016 and has plans to perform a major turnaround on the U1 upgrader in 2018.				
Millennium Mine	294,000	1967	Operating	**Mining**
Steepbank Debottleneck Phase 3	4,000	2007	Operating	**Mining**
Millennium Debottlenecking	23,000	2008	Operating	**Mining**
North Steepbank Extension	180,000	2012	Operating	**Mining**
Fort Hills				Updated: Nov 2016
Teck Resources reports that construction is more than 70% complete at the end of Q3 2016. Suncor has signed an agreement with Fort McKay and Mikisew Cree First Nations for the development of the East Tank Farm, which will support market access for Fort Hills through third-party pipelines.				
Phase 1	160,000	2017	Construction	**Mining**
Debottleneck	20,000	TBD	Approved	**Mining**
Voyageur South				Updated: May 2012
Suncor considers Voyageur South to be a "longer-term" project and has not confirmed a start-up date.				
Phase 1	250,000	2024	Announced	**Mining**
Syncrude Canada Ltd.				
Mildred Lake/Aurora				Updated: Nov 2016
In December, Syncrude performed coker maintenance originally scheduled for mid 2016. Suncor has closed the purchasing of Murphy Oil Corporation's 5% stake in Syncrude; Suncor now owns 53.74% of Syncrude. On Feb. 12, 2016, the company submitted supplemental information to the AER for the mine extension project, which is under review. Syncrude filed its tailings management application with the AER in early November.				
Base Mine Stage 1 & 2 Expansion	290,700	1978	Operating	**Mining**
Stage 3 Expansion	116,300	2006	Operating	**Mining**
Centrifuge Tailings Management	TBD	TBD	Operating	**Mining**
Aurora South Train 1	100,000	TBD	Approved	**Mining**
Aurora South Train 2	100,000	TBD	Approved	**Mining**
Mildred Lake Mine Extension (MLX)	184,000	2023	Application	**Mining**
Teck Resources Limited				
Frontier				Updated: Jun 2016
Teck has filed a project update for the Frontier mining development. The capital cost has been increased to $20.6 billion and the total capacity is 260,000 bbls/d. The regulatory review process is expected to continue through 2016, making 2017 the earliest a decision report is expected. Alberta's environmental impact assessment director says that Teck's environmental impact assessment report for the Frontier project has been deemed complete.				
Phase 1a	85,000	2026	Application	**Mining**
Phase 1b	85,000	2027	Application	**Mining**
Phase 2	90,000	2037	Application	**Mining**
Total E&P Canada Ltd.				
Joslyn North Mine				Updated: Mar 2015
Total has withdrawn the regulatory applications for the Joslyn North Mine.				
Phase 1	100,000	TBD	On Hold	**Mining**
NORTH ATHABASCA REGION — IN SITU				
Athabasca Oil Corporation				
Birch				Updated: Feb 2015
Athabasca lists Birch as one of its long term assets.				
Phase 1	12,000	TBD	Announced	**SAGD**
Dover West Carbonates (Leduc)				Updated: Mar 2015
Athabasca lists Dover West as one of its long term assets.				
Phase 1 Demonstration	6,000	TBD	Approved	**SAGD**
Phase 2 Demonstration	6,000	TBD	Application	**SAGD**
Dover West Sands & Clastics				Updated: Apr 2016
Athabasca has been assessing the development timeline of the Dover West Sands Project. Given the change in global commodity prices that has affected the ability to finance projects in the near term, the considerable uncertainty in regulatory and royalty regimes, and the present shift in focus to Athabasca's Hangingstone asset area in the immediate future, a decision regarding proceeding with the regulatory application has not yet been taken. It is likely that management will advance the regulatory application during 2016.				
Phase 1	12,000	TBD	Application	**SAGD**
Phase 2	35,000	2019	Announced	**SAGD**
Phase 3	35,000	2020	Announced	**SAGD**
Phase 4	35,000	2022	Announced	**SAGD**
Phase 5	35,000	2024	Announced	**SAGD**
BP Plc				
Terre de Grace				Updated: Nov 2015
BP stated in late 2014 that it is unlikely that Terre de Grace will come online before 2020.				
Pilot	10,000	TBD	Approved	**SAGD**
Brion Energy Corporation				
Dover				Updated: Apr 2016
Brion Energy says that the Dover project is on hold.				
Dover Experimental Pilot	2,000	2017	Approved	**SAGD**
Dover North Phase 1	50,000	TBD	On Hold	**SAGD**

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Dover (continued)				Updated: Apr 2016
Dover North Phase 2	50,000	TBD	Approved	SAGD
Dover South Phase 3	50,000	2021	Approved	SAGD
Dover South Phase 4	50,000	2023	Approved	SAGD
Dover South Phase 5	50,000	2025	Approved	SAGD
Mackay River				Updated: Dec 2016
Brion revealed steaming started on Dec. 1, 2016.				
Phase 1	35,000	2017	Operating	SAGD
Phase 2	40,000	TBD	Approved	SAGD
Phase 3	40,000	2020	Approved	SAGD
Phase 4	35,000	2022	Approved	SAGD
Canadian Natural Resources Limited				
Birch Mountain				Updated: Dec 2013
Phase 1	60,000	TBD	Announced	SAGD
Phase 2	60,000	TBD	Announced	SAGD
Cenovus Energy Inc.				
East McMurray				Updated: Dec 2013
Phase 1	30,000	TBD	Announced	SAGD
Steepbank				Updated: Dec 2013
Phase 1	30,000	TBD	Announced	SAGD
Telephone Lake				Updated: Nov 2016
Continuing engineering work, assessing development options.				
Phase A	45,000	TBD	On Hold	SAGD
Phase B	45,000	TBD	Approved	SAGD
E-T Energy Ltd.				
Poplar Creek				Updated: Dec 2016
The previously announced plans for E-T Energy to merge with Bayshore Petroleum and restart the Poplar Creek project have been canceled.				
Experimental Pilot	1,000	2012	Suspended	ET-DSP
Grizzly Oil Sands Ulc				
Thickwood				Updated: Mar 2016
This project application has been withdrawn and closed by the AER.				
Phase 1	6,000	TBD	Cancelled	CSS & SAGD
Phase 2	6,000	TBD	Cancelled	CSS & SAGD
Husky Energy Inc.				
Saleski				Updated: Sep 2016
Husky has received approval from the AER.				
Carbonate Pilot	3,000	TBD	Approved	CSS
Sunrise				Updated: Nov 2016
Husky says that the Sunrise project will not reach full capacity until 2017 due to the shutdown of operations during the Fort McMurray wildfires. Future plans include debottlenecking opportunities.				
Phase 1A	30,000	2015	Operating	SAGD
Phase 1B	30,000	2015	Operating	SAGD
Phase 2A	35,000	TBD	On Hold	SAGD
Phase 2B	35,000	TBD	Approved	SAGD
Future Phases	70,000	TBD	Approved	SAGD
Imperial Oil Limited				
Aspen				Updated: Jun 2016
Alberta's environmental impact director says Imperial's environmental impact assessment report for the Aspen project has been deemed complete. Imperial has said that a final investment decision could be made as early as 2017.				
Phase 1	75,000	2020	Application	SA-SAGD
Phase 2	75,000	TBD	Application	SA-SAGD
Ivanhoe Energy Inc.				
Tamarack				Updated: Apr 2016
Project is cancelled. Suncor has purchased the leases associated with Ivanhoe and FluidOil Ltd., a London-based company, has purchased the HTL technology and the San Antonio, Texas, testing facility.				
Phase 1	20,000	TBD	Cancelled	SAGD
Phase 2	20,000	TBD	Cancelled	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Koch Exploration Canada Corporation				
Dunkirk				Updated: Mar 2016
Koch has withdrawn the Dunkirk project from the regulatory review process, according to an Alberta environmental assessment.				
Commercial Demonstration	2,000	2017	Cancelled	SAGD
Phase 1	30,000	2018	Cancelled	SAGD
Phase 2	30,000	TBD	Cancelled	SAGD
Marathon Oil Corperation				
Birchwood				Updated: Mar 2016
This application has been closed by the AER.				
Demonstration	12,000	TBD	Cancelled	SAGD
Oak Point Energy Ltd.				
Lewis				Updated: Sep 2015
Oak Point Energy says the Lewis project is well positioned (no additional work required) for exploitation when oil prices recover.				
Pilot	1,720	TBD	Approved	SAGD
Prosper Petroleum Ltd.				
Rigel				Updated: Apr 2016
An objection was filed with this project in April 2015; confidential documents have been filed in April 2016.				
Phase 1	10,000	2017	Application	SAGD
Southern Pacific Resource Corp.				
STP-McKay				Updated: May 2015
Southern Pacific and some of its subsidiaries have obtained creditor protection under the companies' Creditors Arrangement Act. STP McKay is being suspended to preserve capital until oil prices recover.				
Phase 1	12,000	2012	Suspended	SAGD
Suncor Energy Inc.				
Dover				Updated: Sep 2016
NSolv Corporation says that since start up in Q2 2015, the pilot plant has produced over 60,000 bbls of oil. Suncor and Nsolv have agreed to continue to test the solvent technology.				
Nsolv BEST Pilot	300	2014	Operating	SAGD
ESEIEH Pilot	TBD	TBD	Operating	SAGD
Firebag				Updated: Nov 2016
Suncor says that work at Firebag continues to focus on well pad construction to sustain existing production, and has deferred planned maintenance from 2016 to 2017. Effective Jan. 1, 2016, Suncor says nameplate capacity at Firebag increased from 180,000 to 203,000 bbls/d as a result of the completion of debottlenecking activities.				
Stage 1	35,000	2004	Operating	SAGD
Stage 2	35,000	2006	Operating	SAGD
Cogeneration and Expansion	25,000	2007	Operating	SAGD
Stage 3	42,500	2011	Operating	SAGD
Stage 4	42,500	2012	Operating	SAGD
Stage 5	62,500	TBD	Approved	SAGD
Stage 6	62,500	TBD	Approved	SAGD
Stage 3-6 Debottleneck	23,000	2015	Operating	SAGD
Lewis				Updated: Nov 2016
Sunor has included the Lewis project as part of its future opportunities in its October 2016 presentation.				
Phase 1	40,000	TBD	Announced	In Situ
Phase 2	40,000	TBD	Announced	In Situ
MacKay River				Updated: Nov 2016
Suncor reports that production at MacKay River averaged 26,600 bbls/d in the third quarter of 2016 and year-to-date production averaged 25,500 bbls/d.				
Phase 1	33,000	2002	Operating	SAGD
Debottleneck	5,000	2014	Operating	SAGD
MR2	20,000	TBD	On Hold	SAGD
Sunshine Oilsands Ltd.				
Legend Lake				Updated: Mar 2016
Regulatory approval is expected in 2016. Once the Legend Lake project is sanctioned for development and construction, additional financing will need to be secured to proceed.				
Phase A1	10,000	TBD	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Legend Lake (continued)				Updated: Mar 2016
Phase A2	30,000	TBD	Announced	SAGD
Phase B1	30,000	TBD	Announced	SAGD
Phase B2	30,000	TBD	Announced	SAGD
Thickwood				Updated: Mar 2016
Once the Thickwood project is sanctioned for development and construction, additional financing will need to be secured to proceed.				
Phase A1	10,000	TBD	Approved	SAGD
Phase A2	30,000	TBD	Announced	SAGD
Phase B	30,000	2021	Announced	SAGD
West Ells				Updated: Dec 2016
Currently Sunshine has all Phase 1 well pairs on steam injection and 5 well pairs converted to production mode. Due to the low commodity price environment, only one well pair has been operating in continuous production.				
Phase A1	5,000	2015	Operating	SAGD
Phase A2	5,000	TBD	Approved	SAGD
Phase A3	30,000	TBD	Announced	SAGD
Phase B	20,000	TBD	Announced	SAGD
Phase C1	30,000	TBD	Announced	SAGD
Phase C2	30,000	TBD	Announced	SAGD
Value Creation Inc.				
Audet				Updated: Sep 2015
Value Creation has acquired SilverWillow Energy and its Audet project.				
Pilot	12,000	TBD	Application	SAGD
SOUTH ATHABASCA REGION — IN SITU				
Athabasca Oil Corporation				
Hangingstone				Updated: Nov 2016
Hangingstone project 1 is now 15 months into its production ramp-up with 23 well pairs converted to SAGD production. Due to slower vertical steam chamber growth than previously expected, the facility is projected to achieve design capacity in 2018. Athabasca Oil is required to resolve SOCs on the expansion application and is expecting approval by the end of 2016.				
HS 1	12,000	2015	Operating	SAGD
HS 2A Debottleneck (1 and 2)	8,000	TBD	Application	SAGD
HS 2B Expansion	32,000	2019	Application	SAGD
HS 3	30,000	2021	Application	SAGD
BlackPearl Resources Inc.				
Blackrod				Updated: Sep 2016
BlackPearl has received approval from the AER. BlackPearl may seek a joint venture arrangement to accelerate development, or may develop the project in smaller stages similar to its Onion Lake heavy oil project.				
Pilot	800	2011	Operating	SAGD
Phase 1	20,000	TBD	Approved	SAGD
Phase 2	30,000	TBD	Approved	SAGD
Phase 3	30,000	TBD	Approved	SAGD
Canadian Natural Resources Limited				
Gregoire Lake				Updated: Dec 2013
Phase 1	60,000	TBD	Announced	SAGD
Phase 2	60,000	TBD	Announced	SAGD
Grouse				Updated: Mar 2016
The AER is waiting for CNRL to resolve outstanding statements of concern filed on the application. The AER has completed its technical review of the application.				
Commercial	40,000	2020	Application	SAGD
Kirby				Updated: Nov 2016
Canadian Natural's board of directors has authorized managment to re-initiate the development of the Kirby North thermal project with engineering and procurement commencing in 2017, with a focus on finding opportunities to reduce construction costs. First steam at Kirby North is expected in 2019 and first oil in 2020.				
KS1 - Kirby South	40,000	2013	Operating	SAGD
KN1 - Kirby North	40,000	TBD	Approved	SAGD
KN2 - Kirby North	60,000	TBD	Approved	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Cavalier Energy Inc.				
Hoole				Updated: May 2015
Regulatory approval for the first phase of the Hoole project was granted in June 2014. Development of this phase is dependent upon Cavalier Energy securing financing and sanctioning by its board of directors.				
Phase 1	10,000	TBD	Approved	SAGD
Phase 2A	35,000	TBD	Announced	SAGD
Phase 2B	35,000	TBD	Announced	SAGD
Cenovus Energy Inc.				
Christina Lake				Updated: Dec 2016
Christina Lake is producing from phases A through E. Cenovus is looking into building a diluent recovery unit at its Bruderheim crude-by-rail terminal. Cenovus began steam generation in the third quarter and expect production to be added in the fourth quarter of 2016. Cenovus says it will restart construction on Phase G in 2017. Cenovus received regulatory approval in December 2015 for expansion Phase H.				
Phase 1A	10,000	2002	Operating	SAGD
Phase 1B	8,800	2008	Operating	SAGD
Phase C	40,000	2011	Operating	SAGD
Phase D	40,000	2012	Operating	SAGD
Phase E	40,000	2013	Operating	SAGD
Optimization (Phases C,D,E)	22,000	2015	Operating	SAGD
Phase F	50,000	2016	Construction	SAGD
Phase G	50,000	2019	Approved	SAGD
Phase H	50,000	TBD	Approved	SAGD
Foster Creek				Updated: Nov 2016
Cenovus says incremental production from phase G was added in the third quarter and ramp-up is expected to take approximately 18 months. Spending related to construction work on phase H was deferred in response to the low commodity price environment, pushing the expected start-up to beyond 2017.				
Phase A	24,000	2001	Operating	SAGD
Phase B Debottleneck	6,000	2003	Operating	SAGD
Phase C Stage 1	10,000	2006	Operating	SAGD
Phase C Stage 2	20,000	2007	Operating	SAGD
Phase D	30,000	2009	Operating	SAGD
Phase E	30,000	2009	Operating	SAGD
Phase F	30,000	2014	Operating	SAGD
Phase G	30,000	2016	Operating	SAGD
Phase H	30,000	TBD	On Hold	SAGD
Future Optimization (Phases F,G,H)	35,000	TBD	Announced	SAGD
Phase J	50,000	TBD	Approved	SAGD
Future Optimization	15,000	TBD	Announced	SAGD
Grand Rapids				Updated: Nov 2016
Cenovus has suspended operations at the Grand Rapids pilot due to low market conditions and has moved the acquired facility to the Cenovus yard for storage.				
Pelican Lake Pilot	600	2011	Suspended	SAGD
Pelican Upper Grand Rapids Phase A	10,000	TBD	On Hold	SAP-SAGD
Pelican Upper Grand Rapids Phase B	32,000	TBD	Approved	SAP-SAGD
Pelican Upper Grand Rapids Phase C	29,000	TBD	Approved	SAP-SAGD
Pelican Upper Grand Rapids Phase D	29,000	TBD	Approved	SAP-SAGD
Pelican Upper Grand Rapids Phase E	32,000	TBD	Approved	SAP-SAGD
Pelican Upper Grand Rapids Phase F	29,000	TBD	Approved	SAP-SAGD
Pelican Upper Grand Rapids Phase G	19,000	TBD	Approved	SAP-SAGD
Narrows Lake				Updated: Nov 2016
Evaluating development options to leverage existing infrastructure at the nearby Christina Lake project.				
Phase A	45,000	TBD	On Hold	SAP-SAGD
Phase B	45,000	TBD	Approved	SAP-SAGD
Phase C	40,000	TBD	Approved	SAP-SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
West Kirby				Updated: Dec 2013
Phase 1	30,000	TBD	Announced	**SAGD**
Winefred Lake				Updated: Dec 2013
Phase 1	30,000	TBD	Announced	**SAGD**
CNOOC Limited				
Long Lake				Updated: Jul 2016
CNOOC Limited subsidary Nexen made an announcement regarding the pipeline rupture and HCU explosion. The pipeline rupture was a result of incompatible pipeline design for ground conditions. Upon investigation, Nexen found that a short-term repair of the HCU is not feasible. Nexen will begin to move the Long Lang upgrader into winter preservation (cold stack) mode. A planned date to return the upgrader to service has not been established. A SAGD-only operation led to a staff reduction of 350 employees by the end of 2016.				
Phase 1	72,000	2008	Operating	**SAGD**
Kinosis (K1A)	20,000	2014	Operating	**SAGD**
Kinosis (K1B)	37,500	TBD	Approved	**SAGD**
Connacher Oil and Gas Limited				
Great Divide				Updated: May 2016
Connacher is reducing production at the Great Divide project to between 7,000 and 8,000 bbls/d in light of "exceptionally low commodity prices." Connacher has filed for CCAA protection and has received permission to sell leases and plants.				
Pod One	10,000	2007	Operating	**SAGD**
Algar	10,000	2010	Operating	**SAGD**
Expansion 1A	12,000	TBD	Approved	**SAGD**
Expansion 1B	12,000	TBD	Approved	**SAGD**
ConocoPhillips Canada Limited				
Surmont				Updated: Apr 2016
ConocoPhillips says that production at Surmont 2 is expected to ramp up through 2017. The Surmont 3 project application/EIA were submitted in 2015. ConocoPhillips submitted responses to the second round of SIR on March 16, 2016.				
Pilot	1,200	1997	Operating	**SAGD**
Phase 1	30,000	2007	Operating	**SAGD**
Phase 2	118,000	2015	Operating	**SAGD**
Phase 2 Debottleneck	57,000	TBD	Approved	**SAGD**
Phase 3 - Tranche 1	45,000	2020	Application	**SAGD**
Phase 3 - Tranche 2	45,000	2021	Application	**SAGD**
Phase 3 - Tranche 3	45,000	2023	Application	**SAGD**
Devon Canada Corporation				
Jackfish				Updated: Nov 2016
Gross production at Jackfish 3 exceeded nameplate capacity, averaging 42,000 bbls/d in the third quarter. In the fourth quarter, Devon expects net heavy oil production to range between 135,000 and 140,000 bbls/d.				
Phase 1	35,000	2007	Operating	**SAGD**
Phase 2	35,000	2011	Operating	**SAGD**
Phase 3	35,000	2014	Operating	**SAGD**
Jackfish East				Updated: Sep 2012
Expansion	20,000	2018	Announced	
Pike				Updated: Jun 2015
Devon has applied to amend total capacity of the Pike project to 70,000 bbls/d from 105,000 bbls/d, using 52 well pads and 12 once through steam generators. FEED is expected to be completed in 2015, as well as a cost structure.				
1A	35,000	2019	Approved	**SAGD**
1B	35,000	2020	Approved	**SAGD**
1C	35,000	TBD	Cancelled	**SAGD**
Grizzly Oil Sands Ulc				
Algar Lake				Updated: Jul 2015
Grizzly has suspended operations at Algar due to low commodity prices.				
Phase 1	6,000	2014	Suspended	**SAGD**
Phase 2	6,000	TBD	Approved	**SAGD**
May River				Updated: Apr 2016
Regulatory approval is expected in 2016.				
Phase 1	6,000	TBD	Application	**SAGD**
Phase 2	6,000	TBD	Application	**SAGD**
Harvest Operations Corp.				
BlackGold				Updated: May 2016
Harvest says the CPF is complete and minor pre-commissioning activities were completed during 2015. The decision to complete commissioning and commence steam injection depends on a number of factors, including the bitumen price environment. According to Harvest, it will cost $57 million to $67 million to start production under the current price environment.				
Phase 1	10,000	TBD	On Hold	**SAGD**
Phase 2	20,000	TBD	Approved	**SAGD**

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Japan Canada Oil Sands Limited				
Hangingstone				Updated: Nov 2016
JACOS has announced that production of the expansion project is expected in mid-2017, construction is about 96% complete and cost estimates for the expansion have been raised. JACOS moved employees to the expansion site from the pilot project, which was shut in following the Fort McMurray fires, due to low commodity prices. JACOS is still evaluating the best time to restart production.				
Expansion	20,000	2017	Construction	**SAGD**
Hangingstone Pilot				Updated: May 2016
Japan Petroleum Exploration will not restart production at its Hangingstone oilsands pilot project due to low oil prices. The plant was shut down in early May in response to the Fort McMurray wildfires. The pilot project has applied to the AER to inject methane to retain reservoir pressures until Q1 2017, when start-up activities could begin. The company will move staff to the expansion project, where production is expected to start in 2017.				
Pilot	11,000	1999	Suspended	**SAGD**
Koch Exploration Canada Corporation				
Muskwa				Updated: Jun 2014
Regulatory approval granted in June 2014.				
Pilot	10,000	TBD	Approved	**SAGD**
Laricina Energy Ltd.				
Germain				Updated: Jun 2016
During the first quarter of 2015, Laricina suspended operations at the Germain CDP.				
Phase 1 CDP	5,000	2013	Suspended	**SC-SAGD**
Phase 2	30,000	TBD	On Hold	**SC-SAGD**
Phase 3	60,000	TBD	On Hold	**SC-SAGD**
Phase 4	60,000	TBD	On Hold	**SC-SAGD**
Saleski				Updated: Jun 2016
Laricina reached approximately 80% completion of detailed engineering and design for Saleski Phase 1 before the decision to defer further development of the project was made in the first quarter of 2015.				
Experimental Pilot	1,800	2011	Suspended	**C & SC-SAGD**
Phase 1	10,700	TBD	On Hold	**C-SAGD**
Phase 2	30,000	TBD	On Hold	**In situ**
Phase 3	60,000	TBD	Announced	**In situ**
Phase 4	60,000	2023	Announced	**In situ**
Phase 5	60,000	2026	Announced	**In situ**
Phase 6	60,000	TBD	Announced	**In situ**
MEG Energy Corp.				
Christina Lake				Updated: Mar 2016
MEG temporarily suspended operations between March 3-4 due to a small fire in the plant's sulphur treatment facility. The company says the fire did not impact the integrity of the main processing facilities, and resulted in no injuries. MEG has reduced its 2016 budget by 50% to $170 million.				
Phase 1 Pilot	3,000	2008	Operating	**SAGD**
Phase 2A	22,000	2009	Operating	**SAGD**
Phase 2B	35,000	2013	Operating	**SAGD**
Phase 3A	50,000	TBD	Approved	**SAGD**
Phase 3B	50,000	TBD	Approved	**SAGD**
Phase 3C	50,000	TBD	Approved	**SAGD**
May River				Updated: Jul 2016
The Alberta director of environmental assessment has issued the final terms of reference for MEG's May River project. The next step is to file the joint EIA and regulatory application. MEG expects to start construction in the fourth quarter of 2019, pending regulatory approval.				
Phase 1	41,000	TBD	Announced	**SAGD**
Phase 2	41,000	TBD	Announced	**SAGD**
Phase 3	82,000	TBD	Announced	**SAGD**
Surmont				Updated: May 2015
The Environmental Assessment director has deemed the Environmental Impact Assessment report complete for MEG Energy Corp.'s Surmont Project.				
Phase 1	40,000	TBD	Application	**SAGD**
Phase 2	40,000	TBD	Application	**SAGD**
Phase 3	40,000	TBD	Application	**SAGD**
OSUM Oil Sands Corp.				
Sepiko Kesik				Updated: Mar 2016
The AER is waiting for confirmation from the Aboriginal Consultation Office (ACO) regarding First Nations consultation adequacy. The AER has completed its technical review of the application.				
Phase 1	30,000	2018	Application	**CSS-SAGD**
Phase 2	30,000	2020	Application	**CSS-SAGD**

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
PTT Exploration and Production				
Mariana - Thornbury				Updated: Apr 2016
PTTEP has postponed key development projects such as Mariana Oil Sands Project. PTTEP responded to the second round of SIR requests on April 19, 2016.				
Phase 1	20,000	2021	Application	SAGD
Renergy Petroleum (Canada) Co., Ltd.				
Muskwa				Updated: Mar 2015
Renergy Petroleum received regulatory approval in January.				
Muskwa Experimental Pilot	440	2015	Approved	Steam & CO_2
Statoil				
Leismer				Updated: Jun 2015
Demonstration	10,000	2010	Operating	SAGD
Commercial	10,000	2011	Operating	SAGD
Expansion	20,000	TBD	Approved	SAGD
Northwest	20,000	TBD	Disclosed	SAGD
Suncor Energy Inc.				
Chard				Updated: Nov 2012
Phase 1	40,000	TBD	Announced	SAGD
Meadow Creek East				Updated: Nov 2016
Jacobs Engineering has been awarded the design basis memorandum contract for the Meadow Creek project, using a replication strategy. Suncor listed this project as a future opportunity in its October 2016 presentation.				
Phase 1	40,000	2020	Approved	SAGD
Phase 2	40,000	2022	Approved	SAGD
Surmont Energy Ltd.				
Wildwood				Updated: Sep 2016
Surmont has received approval for the project from the AER.				
Phase 1	12,000	TBD	Approved	SAGD
Value Creation Inc.				
Advanced TriStar				Updated: Apr 2016
Alberta Environmental Assessment Agency has deemed the Environmental Impact Assessment report compete for the ATS project. The review took 165 weeks.				
ATS-1	30,000	TBD	Application	SAGD
ATS-2	30,000	TBD	Application	SAGD
DOEx (Demonstration of Excellence)				Updated: May 2014
Value Creation has filed an amendment to its regulatory approval to increase production capacity from 1,000 to 6,000 bbls/d.				
Pilot	6,000	2018	Application	SAGD
COLD LAKE REGION — IN SITU				
Baytex Energy Corp.				
Gemini				Updated: Jun 2015
Baytex has made the decision to decommission the Gemini SAGD pilot due to low oil pricing. The company says that since operations started last year, the pilot has successfully captured the key data associated with its objectives. The company's primary objective was to confirm reservoir production capacity to support a commercial scale project. Following regulatory approval for the commercial project, any subsequent sanctioning decision will be considered in the context of the project economics in a higher commodity price environment.				
Pilot	1,200	2014	Suspended	SAGD
Commercial	5,000	TBD	Approved	SAGD
Birchwood Resources Inc.				
Sage				Updated: Mar 2016
This application has been closed, application withdrawn.				
Pilot	5,000	TBD	Cancelled	LP-SAGD
Canadian Natural Resources Limited				
Primrose & Wolf Lake				Updated: Nov 2015
Canadian Natural says that it continues to progress low pressure steamflood operations at Primrose Lase Area 1 as well as low pressure CSS operations at Primrose East Area 2, and operations at Primrose East are meeting expectations.				
Wolf Lake	13,000	1985	Operating	CSS
Primrose South	45,000	1985	Operating	CSS
Primrose North	30,000	2006	Operating	CSS
Primrose East	32,000	2008	Operating	CSS

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Devon Canada Corporation				
Walleye				Updated: Mar 2015
Devon says the Walleye project is currently on hold.				
Phase 1	9,000	TBD	Approved	SAGD
Husky Energy Inc.				
Caribou				Updated: Nov 2010
Demonstration	10,000	TBD	Approved	SAGD
Tucker				Updated: Nov 2016
Production at Tucker has exceeded Husky's 2016 target of 20,000 bbls/d.				
Phase 1	30,000	2006	Operating	SAGD
Imperial Oil Limited				
Cold Lake				Updated: Jun 2016
Looking ahead, Cold Lake, including Nabiye, will manage steaming strategies across all assets to enhance resource recovery. Late in 2015, Alberta Environment and Parks issued the final terms of reference for the Cold Lake Expansion project; the regulatory application was filed March 11. In June, Imperial filed an application to terminate the SA-SAGD pilot project and integrate the pilot into the Cold Lake project based on successful results.				
Phase 1-10	110,000	1985	Operating	CSS
Phase 11-13	30,000	2002	Operating	CSS
Experimental SA-SAGD	TBD	2010	Operating	SA-SAGD
Phase 14-16	40,000	2015	Operating	CSS
Expansion	55,000	TBD	Application	SA-SAGD
OSUM Oil Sands Corp.				
Orion				Updated: Jul 2015
OSUM plans to revise the approved well pad development sequence at Orion, deferring two originally planned pads, and developing one new sustaining pad as well as three new pads to increase production to the approved 20,000 bbls/d.				
Phase 1	10,000	2007	Operating	SAGD
Phase 2	10,000	TBD	Approved	SAGD
Taiga				Updated: Mar 2015
OSUM says that Taiga Phase 1 will be advanced in 2015-16 subject to financing.				
Phase 1	12,500	TBD	Approved	CSS-SAGD
Phase 2	12,500	TBD	Approved	CSS-SAGD
Phase 3	20,000	TBD	Approved	CSS-SAGD
Pengrowth Energy Corporation				
Lindbergh				Updated: Sep 2016
The AER has approved the Lindbergh expansion project, with a thermal well compatibility condition prior to drilling start. The 2016 allocation of $14 million of capital to Lindbergh will be directed to maintenance activities as well as further pre-engineering and design for the phase two expansion. Final investment decision will be based in part on commodity prices. Pengrowth has applied to the AER to drill infill wells in Phase 1.				
Pilot	1,260	2012	Operating	SAGD
Phase 1	11,240	2015	Operating	SAGD
Phase 1 Optimization	3,500	TBD	Operating	SAGD
Phase 2 Expansion	17,500	TBD	On Hold	SAGD
PEACE RIVER REGION — IN SITU				
Andora Energy Corporation				
Sawn Lake				Updated: Nov 2016
Project partner Pan Orient Energy says that the demonstration project will be suspended at the end of February 2016 due to the expectation that extremely low bitumen prices may continue for some time, as well as the estimated time required for regulatory approval of the 3,200-bbls/d expansion application, which was submitted in April 2016. It is expected that a reactivation of the demonstration project would be considered as part of the expansion.				
Demonstration	1,400	2014	Suspended	SAGD
Expansion	3,200	2019	Application	SAGD
Baytex Energy Corp.				
Cliffdale				Updated: Nov 2015
Baytex says that operations at the Cliffdale CSS pilot were suspended in late September 2015.				
Pilot	2,000	2011	Suspended	CSS
Dawson				Updated: Jul 2015
Touchstone Exploration Inc. has disposed of its interest in the Dawson area of Alberta for cash consideration of $2.15 million.				
Experimental Demonstration	TBD	2014	Suspended	CSS
Harmon Valley				Updated: Feb 2013
Pilot	TBD	2011	Operating	CSS

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Murphy Oil Company Ltd.				
Seal/Cadotte				Updated: Oct 2016
The AER has sent another SIR request on April 19, 2016, and a response is required by May 10, 2016. Oil production for 2016 in western Canada, excluding Syncrude, is expected to average 3,600 barrels. The decrease in oil production in 2016 arises from well declines and selective economic related well shut-ins in the Seal area due to lower heavy oil prices.				
Pilot	TBD	TBD	Operating	HCSS
Demonstration	12,450	2019	Application	HCSS
Northern Alberta Oil Ltd.				
Sawn Lake				Updated: Nov 2015
Parent company Deep Well Oil & Gas says it is waiting on the preliminary results of the Sawn Lake SAGD pilot operated by Andora Energy to fine tune the horizontal cyclic steam project design. Deep Well is a partner in the Sawn Lake project.				
Pilot	700	TBD	Approved	HCSS
Penn West Petroleum Ltd.				
Harmon Valley South				Updated: Dec 2016
Penn West has announced in their annual in situ progress report to the AER that they have begun suspension activities due to low commodity prices.				
Pilot	TBD	2014	Suspended	HCSS
Seal Main				Updated: Mar 2016
The AER is waiting for PennWest to resolve outstanding Statements of Concern filed on the application. The AER has completed its technical review of the application.				
Pilot	75	2011	Operating	HCSS
Commercial	10,000	TBD	Application	HCSS
Royal Dutch Shell plc				
Peace River				Updated: Jan 2016
Shell has stopped construction of the Carmon Creek project. Shell is retaining the project leases and some equipment as evaluations are ongoing.				
Cadotte Lake	12,500	1986	Operating	CSS
Carmon Creek - Phase 1	40,000	TBD	On Hold	VSD
Carmon Creek - Phase 2	40,000	TBD	On Hold	VSD
SCCC Petroleum Corporation				
Red Earth				Updated: Jun 2016
SCCC Petroleum received regulatory approval for the pilot phase in July 2015.				
Pilot	440	2009	Approved	Steam & CO_2
NORTH ATHABASCA REGION — UPGRADER				
BP Plc				
Terre de Grace				Updated: Nov 2015
BP stated in late 2014 that it is unlikely that Terre de Grace would come online before 2020.				
Pilot	8,400	TBD	Approved	ADC USP
Canadian Natural Resources Limited				
Horizon				Updated: Nov 2016
Canadian Natural Resources executed a major planned turnaround in July to tie-in Phase 2B. Current production volumes at Horizon are 175,00 bbls/d since start-up of Phase 2B. Horizon Phase 3 reached 87% physically complete in Q3; Phase 3 remains on track for targeted start-up in Q4 2017.				
Phase 1	110,000	2009	Operating	UPG
Reliability - Tranche 2	5,000	2014	Operating	UPG
Phase 2A	12,000	2014	Operating	UPG
Phase 2B	45,000	2016	Operating	UPG
Phase 3	80,000	2017	Construction	UPG
E-T Energy Ltd.				
Poplar Creek				Updated: Feb 2016
E-T and Bayshore Petroleum will merge and continue operating as Bayshore. The company plans to restart production at the Poplar Creek site using a combination of E-T and Bayshore's proprietary technologies.				
Experimental Pilot	TBD	TBD	Announced	CCC
Ivanhoe Energy Inc.				
Tamarack				Updated: Apr 2016
Project is cancelled. Suncor has purchased the leases associated with Ivanhoe; FluidOil Ltd., a London-based company, has purchased the HTL technology and the San Antonio, Texas, testing facility.				
Phase 1	34,784	TBD	Cancelled	HTL

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Suncor Energy Inc.				
Base Operations				Updated: Nov 2016
Suncor completed major planned maintenance on its U2 upgrader in 2016 and has plans to perform a major turnaround on the U1 upgrader in 2018.				
U1 and U2	225,000	1967	Operating	UPG
Millennium Vacuum Unit	35,000	2005	Operating	UPG
Millennium Coker Unit	97,000	2008	Operating	UPG
Syncrude Canada Ltd.				
Mildred Lake/Aurora				Updated: Nov 2016
In December, Syncrude performed coker maintenance originally scheduled for mid 2016. Suncor has closed the purchasing of Murphy Oil Corporation's 5% stake in Syncrude; Suncor now owns 53.74% of Syncrude. On Feb. 12, 2016, the company submitted supplemental information to the AER for the mine extension project, which is under review. Syncrude filed its tailings management application with the AER in early November.				
Base Plant Stage 1 & 2 Debottleneck	250,000	1978	Operating	UPG
Stage 3 Expansion (UE-1)	100,000	2006	Operating	UPG
Stage 3 Debottleneck	75,000	TBD	Announced	UPG
SOUTH ATHABASCA REGION — UPGRADER				
CNOOC Limited				
Long Lake				Updated: Jul 2016
CNOOC Limited subsidary Nexen made an announcement regarding the pipeline rupture and HCU explosion. The pipeline rupture was a result of incompatible pipeline design for ground conditions. Upon investigation, Nexen found that a short-term repair of the HCU is not feasible. Nexen will begin to move the Long Lang upgrader into winter preservation (cold stack) mode. A planned date to return the upgrader to service has not been established. A SAGD-only operation led to a staff reduction of 350 employees by the end of 2016.				
Phase 1	58,500	2009	Suspended	OrCrude
Value Creation Inc.				
Advanced TriStar				Updated: Apr 2016
The Alberta Environmental Assessment Agency has deemed the Environmental Impact Assessment report compete for the ATS project. The review took 165 weeks.				
ATS-1	60,000	TBD	Application	ATS USP
ATS-2	60,000	TBD	Application	ATS USP
DOEx (Demonstration of Excellence)				Updated: May 2014
Value Creation has filed an amendment to its regulatory approval to increase production capacity from 1,000 to 6,000 bbls/d.				
Pilot	12,000	2018	Application	ATS USP
INDUSTRIAL HEARTLAND REGION — UPGRADER				
North West Upgrading Inc.				
Redwater Upgrader				Updated: Apr 2016
As the result of an on site pedestrian vehicle incident Dec. 9, 2015, one of NWR's employees was fatally injured. The on-site workforce has reached 3,800 people. To date, approximately 400 modules have been installed with more than 600 additional modules standing in various stages of assembly at module fabrication shops. Module delivery and assembly into the refinery will continue throughout 2016, targeted completion in Q4 2017.				
Phase 1	50,000	2017	Construction	UPG
Phase 2	50,000	TBD	Approved	UPG
Phase 3	50,000	TBD	Approved	UPG
Shell Albian Sands				
Scotford Upgrader				Updated: Dec 2016
Shell has announced that it has completed the HCU debottleneck project to increase capacity by 20%. Construction took 17 months.				
Commercial	155,000	2003	Operating	UPG
Expansion	100,000	2011	Operating	UPG
Scotford HCU Debottleneck	14,000	TBD	Operating	UPG
Value Creation Inc.				
Heartland				Updated: Jul 2016
Value Creation has filed an amendment application for the Heartland upgrader project changing the project from 3 phases to 2 phases and reducing total production to 173,600 bbls/d. The company will be using DRU, ADG, CDC & CORe technologies to process the diluted bitumen feedstock.				
Phase 1A	43,400	2019	Application	UPG
Phase 1B	43,400	2021	Application	UPG
Phase 2	86,800	TBD	Application	UPG

GLOSSARY of oil sands terms

ASPHALTENES
The heaviest and most concentrated aromatic hydrocarbon fractions of bitumen.

BARREL
The traditional measurement for crude oil volumes. One barrel equals 42 U.S. gallons (159 litres). There are 6.29 barrels in one cubic metre of oil.

BITUMEN
Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oil sand, but saturation varies.

COGENERATION
The simultaneous production of electricity and steam, which is part of the operations of many oil sands projects.

COKING
An upgrading/refining process used to convert the heaviest fraction of bitumen into lighter hydrocarbons by rejecting carbon as coke. Coking can be either delayed coking (semi-batch) or fluid coking (continuous).

CONDENSATE
Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid, and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

CONVENTIONAL CRUDE OIL
Mixture of mainly pentane and heavier hydrocarbons recoverable at a well from an underground reservoir, and liquid at atmospheric pressure and temperature. Unlike bitumen, it flows through a well without stimulation and through a pipeline without processing or dilution.

CRACKING
An upgrading/refining process for converting large, heavy molecules into smaller ones. Cracking processes include fluid cracking and hydrocracking.

CYCLIC STEAM STIMULATION (CSS)
An in situ production method incorporating cycles of steam injection, steam soaking and oil production. The steam reduces the viscosity of the bitumen and allows it to flow to the production well.

DENSITY
The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m^3) or degrees on the American Petroleum Institute (API) gravity scale; in western Canada, oil up to 900 kg/m^3 is considered light-to-medium crude—oil above this density is deemed as heavy oil or bitumen.

DILBIT
Bitumen that has been reduced in viscosity through addition of a diluent such as condensate or naphtha.

DILUENT
A light hydrocarbon blended with bitumen to enable pipeline transport. See Condensate.

EXTRACTION
A process, unique to the oil sands industry, that separates the bitumen from the oil sand using hot water, steam and caustic soda.

FROTH TREATMENT
The means to recover bitumen from the mixture of water, bitumen and solids "froth" produced in hot-water extraction (in mining-based recovery).

GASIFICATION
A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy by-products.

GROUNDWATER
Water accumulations below the Earth's surface that supply fresh water to wells and springs.

HEAVY CRUDE OIL
Oil with a gravity below 22 degrees API. Heavy crudes must be blended or mixed with condensate to be shipped by pipeline.

HYDROCRACKING
Refining process for reducing heavy hydrocarbons into lighter fractions, using hydrogen and a catalyst; can also be used in upgrading bitumen.

HYDROTRANSPORT
A slurry process that transports water and oil sand through a pipeline to primary separation vessels located in an extraction plant.

HYDROTREATER
An upgrading/refining process unit that reduces sulphur and nitrogen levels in crude oil fractions by catalytic addition of hydrogen.

IN SITU
A Latin phrase meaning "in its original place." In situ recovery refers to various drilling-based methods used to recover deeply buried bitumen deposits.

IN SITU COMBUSTION
An enhanced oil recovery method that works by generating combustion gases (primarily CO and CO_2) downhole, which then "push" the oil towards the recovery well.

LEASE
A legal document from the province of Alberta giving an operator the right to extract bitumen from the oil sand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

LIGHT CRUDE OIL
Liquid petroleum with a gravity of 28 degrees API or higher. A high-quality light crude oil might have a gravity of about 40 degrees API. Upgraded crude oils from the oil sands run around 30-33 degrees API (compared to 32-34 for Light Arab and 37-40 for West Texas Intermediate).

MATURE FINE TAILINGS
A gel-like material resulting from the processing of clay fines contained within the oil sands.

OIL SANDS
Bitumen-soaked sand deposits located in three geographic regions of Alberta: Athabasca, Cold Lake and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total in-place deposits of bitumen in Alberta are estimated at 1.7 trillion to 2.5 trillion barrels.

OVERBURDEN
A layer of sand, gravel and shale between the surface and the underlying oil sand in the mineable oil sands region that must be removed before oil sands can be mined.

PERMEABILITY
The capacity of a substance (such as rock) to transmit a fluid, such as crude oil, natural gas or water. The degree of permeability depends on the number, size and shape of the pores and/or fractures in the rock and their interconnections. It is measured by the time it takes a fluid of standard viscosity to move a given distance. The unit of permeability is the Darcy.

PETROLEUM COKE
Solid, black hydrocarbon that is left as a residue after the more valuable hydrocarbons have been removed from the bitumen by heating the bitumen to high temperatures.

PRIMARY PRODUCTION
An in situ recovery method that uses natural reservoir energy (such as gas drive, water drive and gravity drainage) to displace hydrocarbons from the reservoir into the wellbore and up to the surface. Primary production uses an artificial lift system in order to reduce the bottomhole pressure or increase the differential pressure to sustain hydrocarbon recovery, since reservoir pressure decreases with production.

RECLAMATION
Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

STEAM ASSISTED GRAVITY DRAINAGE (SAGD)
An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

SURFACE MINING
Operations to recover oil sands by open-pit mining using trucks and shovels. Less than 20 per cent of Alberta's oil sands resources are located close enough to the surface (within 75 metres) for mining to be economic.

SYNTHETIC CRUDE OIL
A manufactured crude oil comprised of naphtha, distillate and gas oil-boiling range material. Can range from high-quality, light sweet bottomless crude to heavy, sour blends.

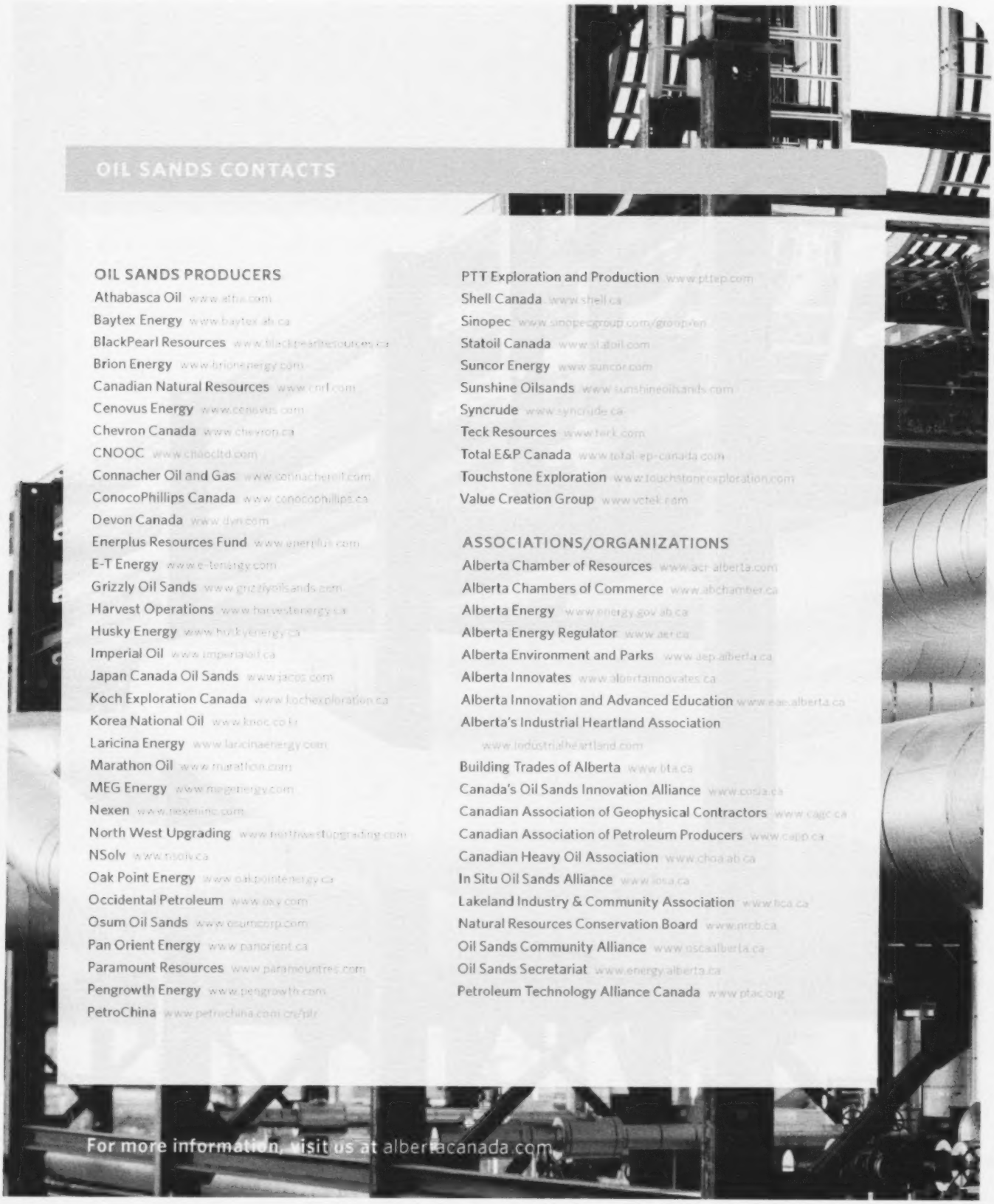
TAILINGS
A combination of water, sand, silt and fine clay particles that is a by-product of removing the bitumen from the oil sand through the extraction process.

TAILINGS SETTLING BASIN
The primary purpose of the tailings settling basin is to serve as a process vessel, allowing time for tailings water to clarify and silt and clay particles to settle so that the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

THERMAL RECOVERY
Any in situ process where heat energy (generally steam) is used to reduce the viscosity of bitumen to facilitate recovery.

UPGRADING
The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

VISCOSITY
The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.



OIL SANDS CONTACTS

OIL SANDS PRODUCERS

Athabasca Oil www.athx.com
Baytex Energy www.baytex.ab.ca
BlackPearl Resources www.blackpearlresources.ca
Brion Energy www.brionenergy.com
Canadian Natural Resources www.cnrl.com
Cenovus Energy www.cenovus.com
Chevron Canada www.chevron.ca
CNOOC www.cnoocltd.com
Connacher Oil and Gas www.connacheroil.com
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Devon Canada www.dvn.com
Enerplus Resources Fund www.enerplus.com
E-T Energy www.e-tenergy.com
Grizzly Oil Sands www.grizzlyoilsands.com
Harvest Operations www.harvestenergy.ca
Husky Energy www.huskyenergy.ca
Imperial Oil www.imperialoil.ca
Japan Canada Oil Sands www.jacos.com
Koch Exploration Canada www.kochexploration.ca
Korea National Oil www.knoc.co.kr
Laricina Energy www.laricinaenergy.com
Marathon Oil www.marathon.com
MEG Energy www.megenergy.com
Nexen www.nexeninc.com
North West Upgrading www.northwestupgrading.com
NSolv www.nsolv.ca
Oak Point Energy www.oakpointenergy.ca
Occidental Petroleum www.oxy.com
Osum Oil Sands www.osumcorp.com
Pan Orient Energy www.panorient.ca
Paramount Resources www.paramountres.com
Pengrowth Energy www.pengrowth.com
PetroChina www.petrochina.com.cn/ptr
PTT Exploration and Production www.pttep.com
Shell Canada www.shell.ca
Sinopec www.sinopecgroup.com/groupen
Statoil Canada www.statoil.com
Suncor Energy www.suncor.com
Sunshine Oilsands www.sunshineoilsands.com
Syncrude www.syncrude.ca
Teck Resources www.teck.com
Total E&P Canada www.total-ep-canada.com
Touchstone Exploration www.touchstoneexploration.com
Value Creation Group www.vcteh.com

ASSOCIATIONS/ORGANIZATIONS

Alberta Chamber of Resources www.acr-alberta.com
Alberta Chambers of Commerce www.abchamber.ca
Alberta Energy www.energy.gov.ab.ca
Alberta Energy Regulator www.aer.ca
Alberta Environment and Parks www.aep.alberta.ca
Alberta Innovates www.albertainnovates.ca
Alberta Innovation and Advanced Education www.eae.alberta.ca
Alberta's Industrial Heartland Association www.industrialheartland.com
Building Trades of Alberta www.bta.ca
Canada's Oil Sands Innovation Alliance www.cosia.ca
Canadian Association of Geophysical Contractors www.cagc.ca
Canadian Association of Petroleum Producers www.capp.ca
Canadian Heavy Oil Association www.choa.ab.ca
In Situ Oil Sands Alliance www.iosa.ca
Lakeland Industry & Community Association www.lica.ca
Natural Resources Conservation Board www.nrcb.ca
Oil Sands Community Alliance www.oscaalberta.ca
Oil Sands Secretariat www.energy.alberta.ca
Petroleum Technology Alliance Canada www.ptac.org

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